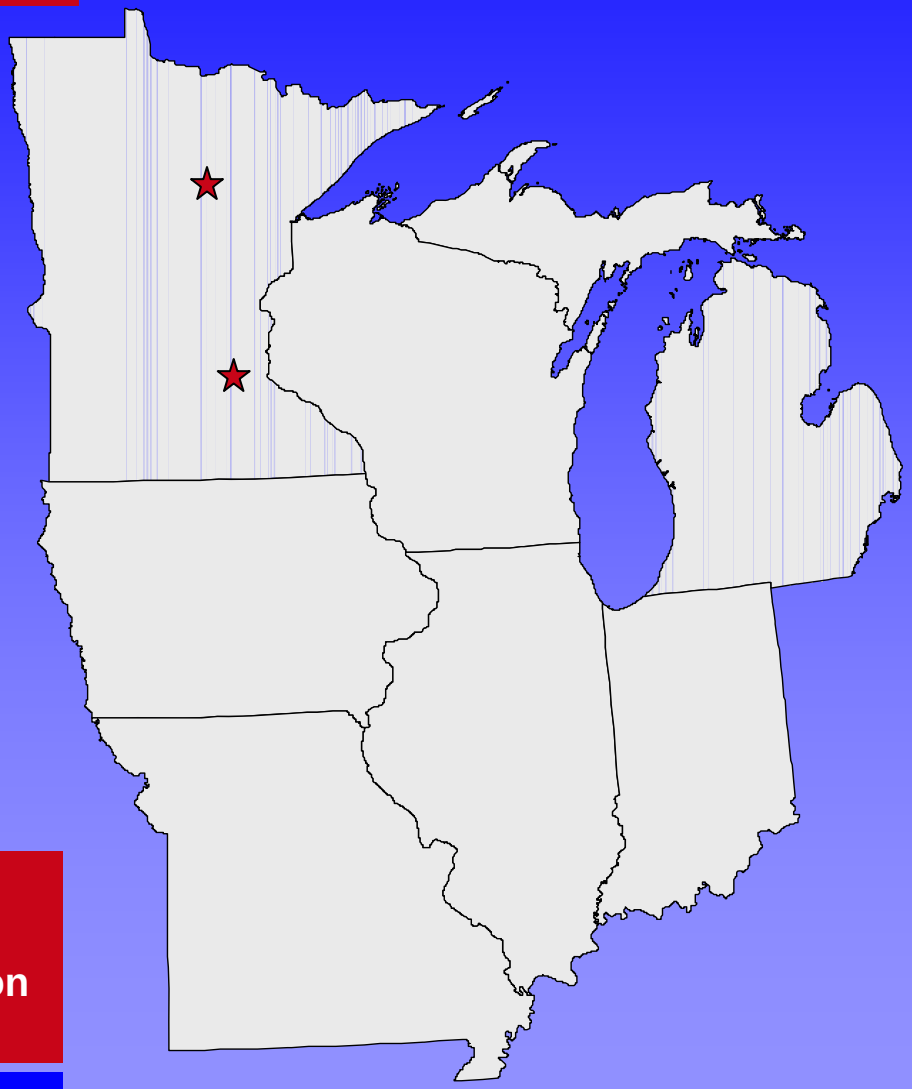
Changing Midwest Forests

Seeing the forest,
but maybe not the same trees



Northern Research Station
USDA Forest Service

Brian Palik, Team Leader
USDA Forest Service
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Center for Research on Ecosystem Change

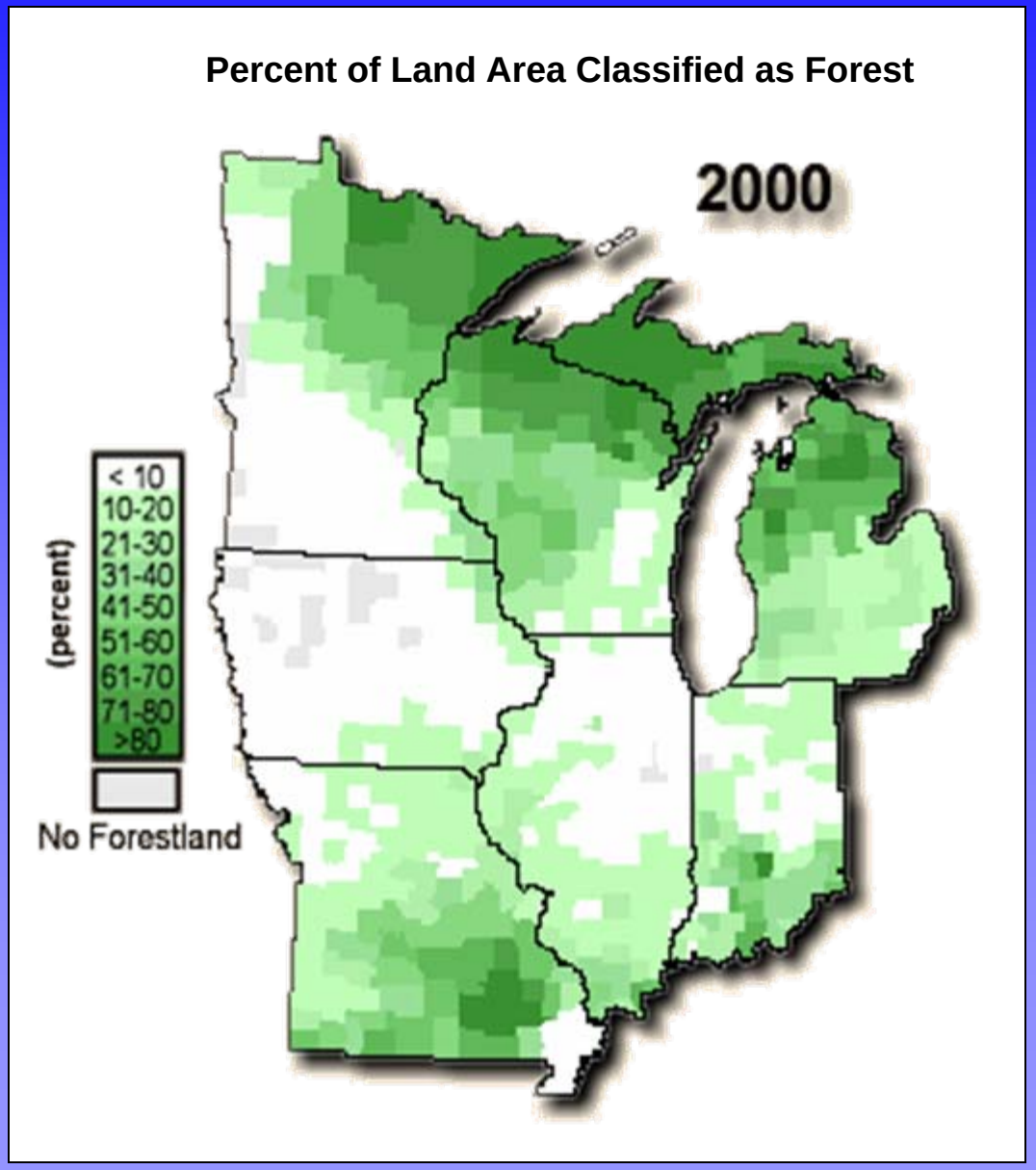
A Given: Our Forest are Going to Change Over the Next 10 Years and Beyond

- -Importance of Forests in the Region
- -Review: Forests Change over Time
- -Contemporary Drivers of Forest Change and Ecological Expectations

Forests in the Midwestern Landscape

-Approximately 77 million acres of forest

-Approximately 30 percent of the total land area classified as forest

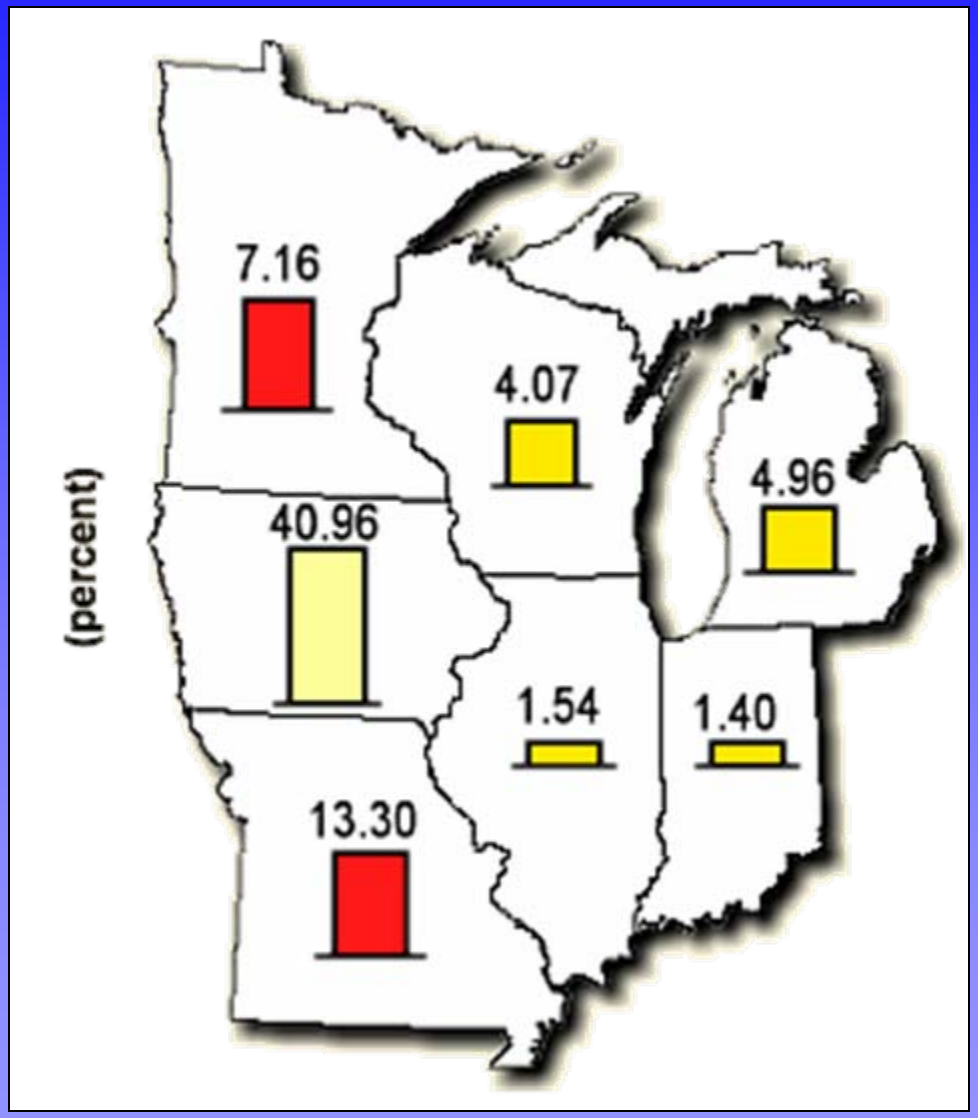


Source: Changing Mid-West Assessment. Northern Research Station

Percent Change in the Area of Forest, 1980 - 2000

-An increase in forest area generally

-Larger increases in less forested states



Source: Changing Mid-West Assessment.
Northern Research Station

Importance of Forests

Economic Importance: Indiana

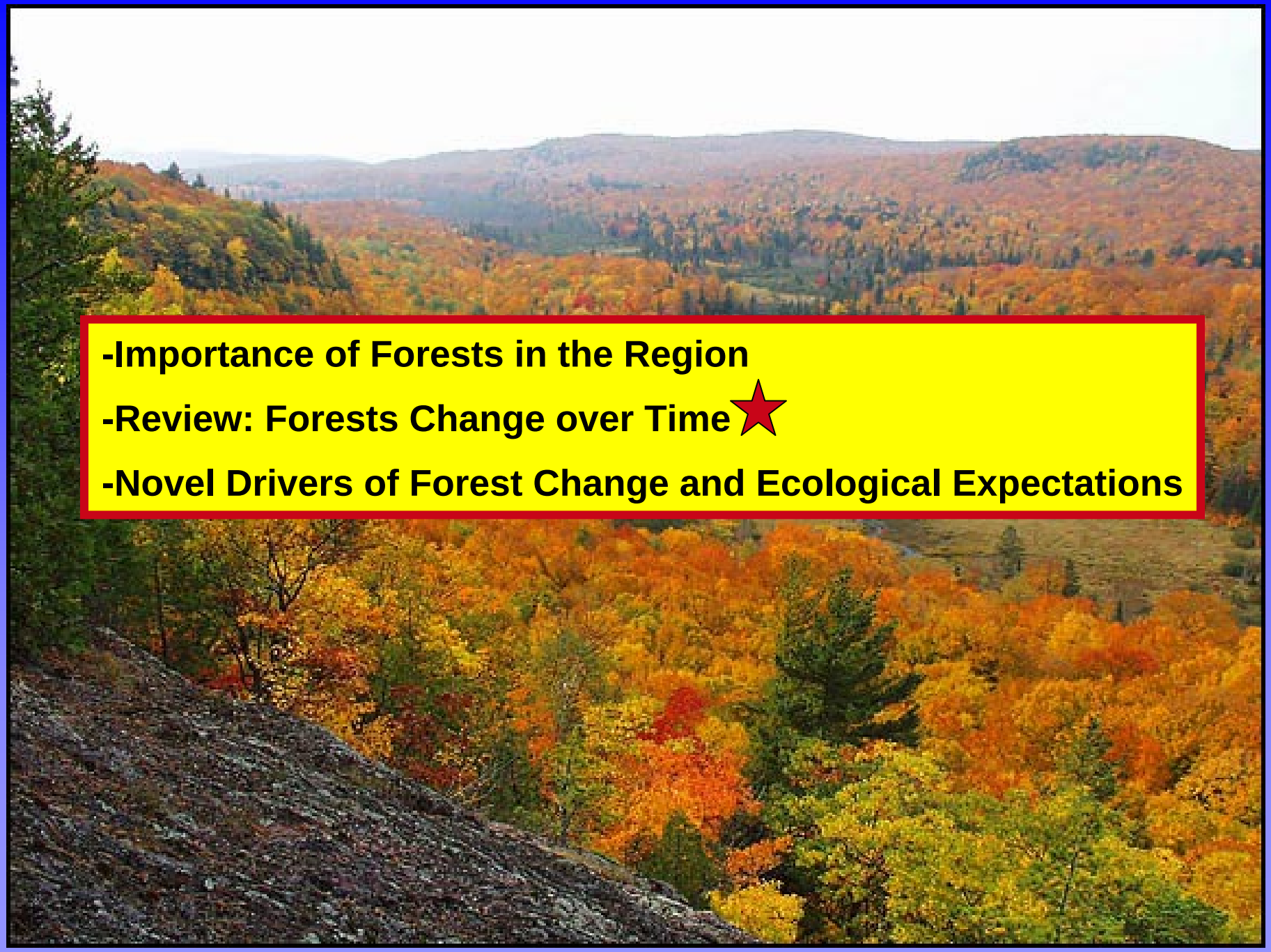
- -$9 billion annually contribution to the economy
- -$1 billion annually from forest-based recreation and tourism
- -$175 million from the sale of trees
- -$25 million from the sale of associated forest products
- -$1.4 billion annually from forest-based manufacturing
- -$8 billion in value of shipments from forest-based manufacturing
- -54,000 jobs

Similar for other states

Source: USDA Forest Service S&PF NA TP 02 04

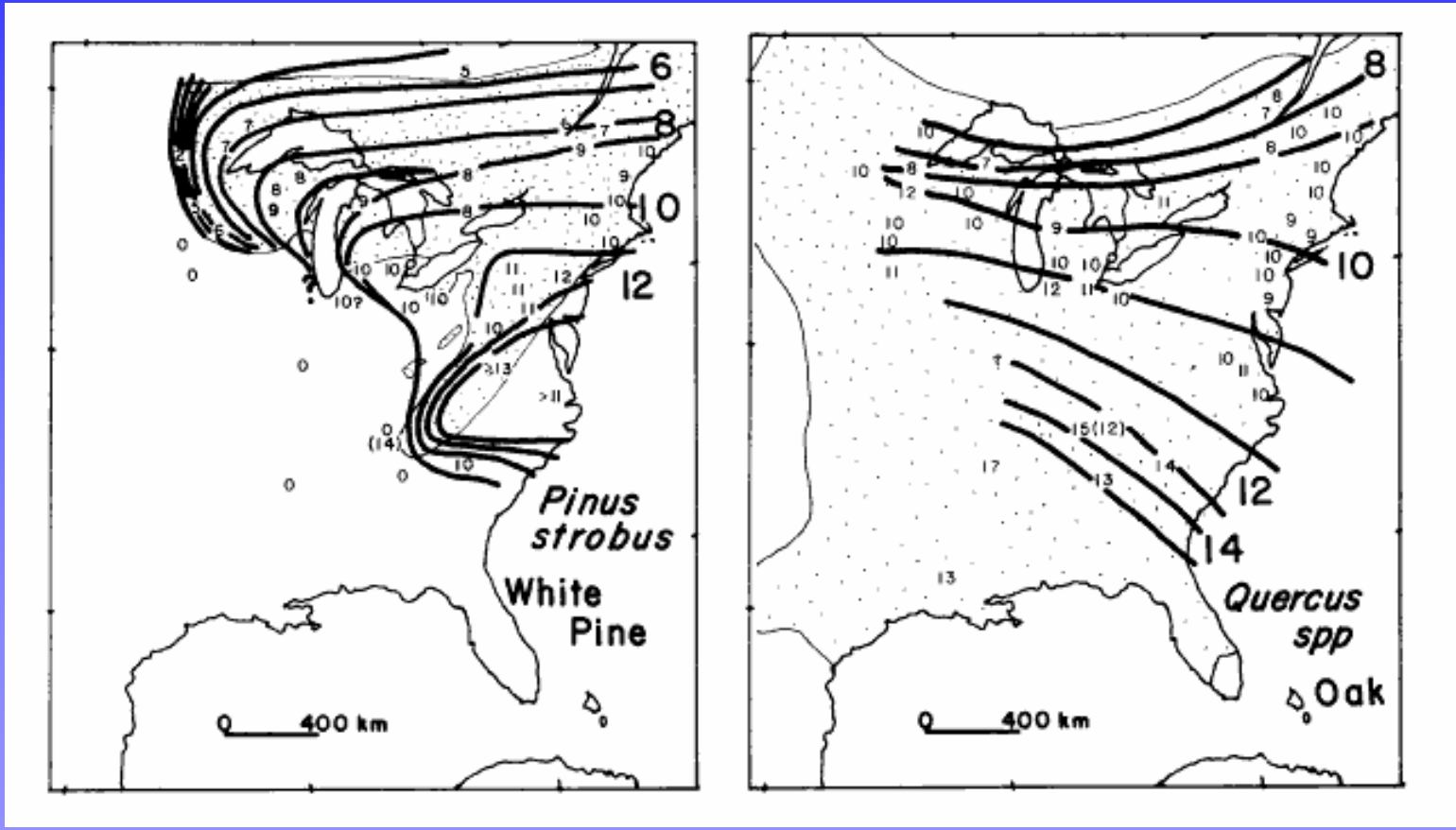
Forest are important to the region

Ecological changes in forests are something we should be thinking about


-Importance of Forests in the Region
-Review: Forests Change over Time
-Novel Drivers of Forest Change and Ecological Expectations

Forests Change! We should be used to it….

-Trees species migrate in response to changing climate



Source: Davis 1983. Ann. Missouri Bot. Gard.

Forests Change! We should be used to it….

-Composition and structure changes during succession

…and after landuse change like the initial agricultural abandonment

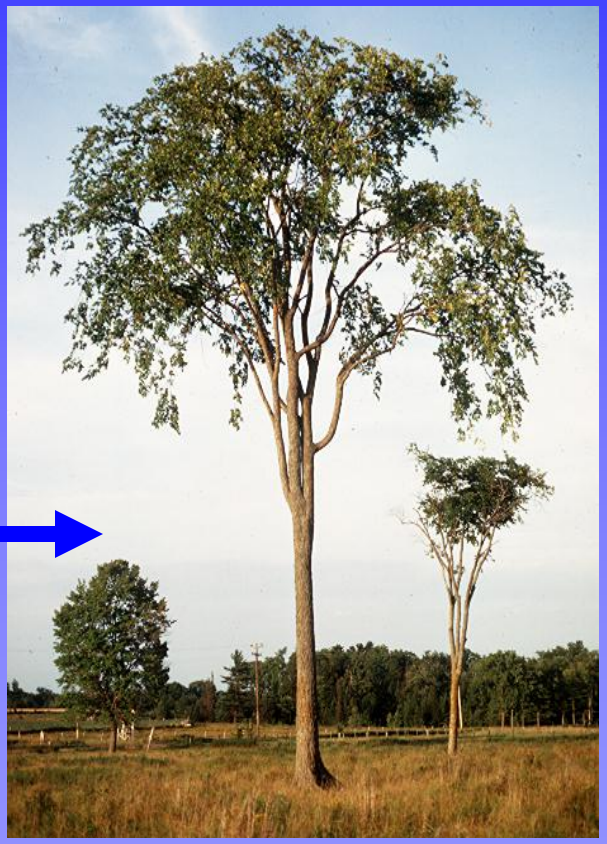
And in fact the forest is still changing regionally, after the initial cut over and after agricultural abandonment

Forests Change! We should be used to it….

-Major tree species have been decimated by invasive species

American Chestnut

American Elm



Forests Change! We should be used to it….

-What's different now?

-Change is rapid
-Changes are cumulative
-Drivers are novel and interactive

-Importance of Forests in the Region

-Review: Forests Change over Time

-Novel Drivers of Forest Change and Ecological Expectations

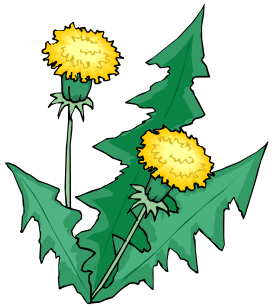
Negative outcomes, but also some positive

Drivers of Forest Change (and where they are being driven)

The Big Four

Climate Change

Nitrogen Deposition



Invasive Species

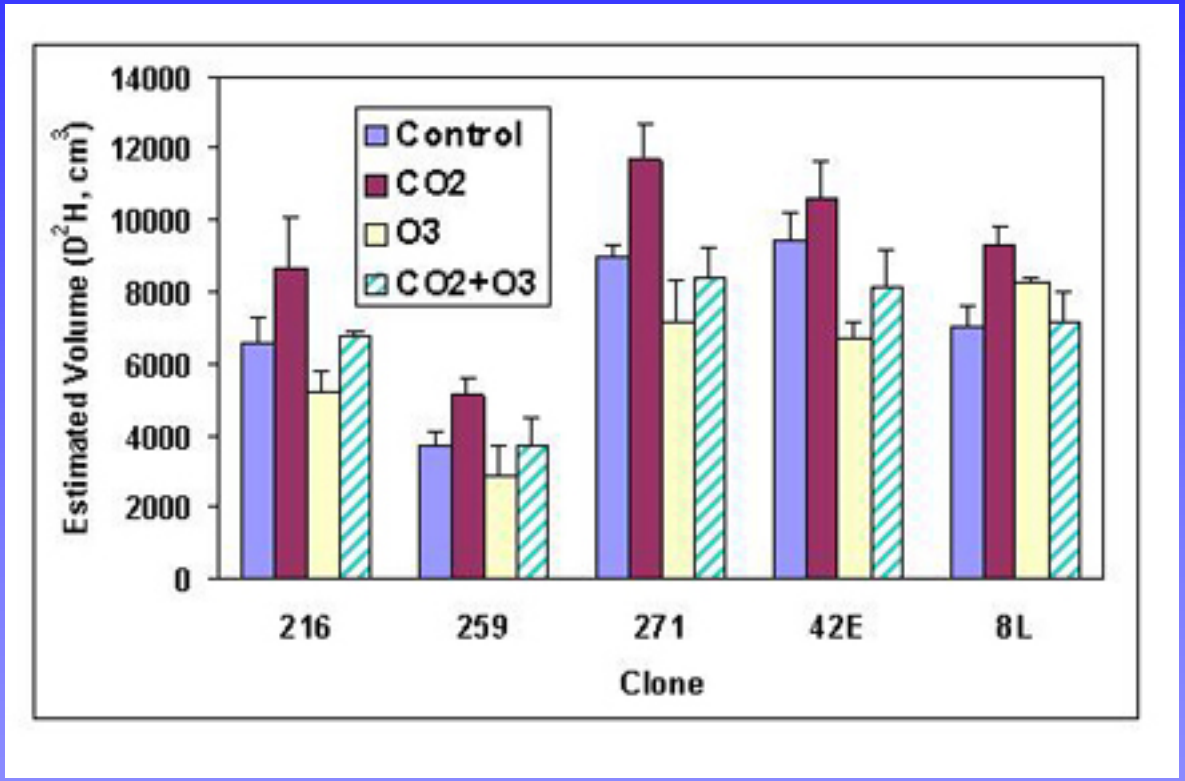
Landuse Change

Climate Change: Forest Responses

CO_2	Temperature (magnitude, seasonality)	Precipitation (amount, seasonality)	Response
↑	↑	 ↑	Increased Productivity?
↑	↑	 ↑↓	Species Range Shifts
↑	↑	 ↑↓	Novel Pest Behavior

Climate Change: Forest Productivity

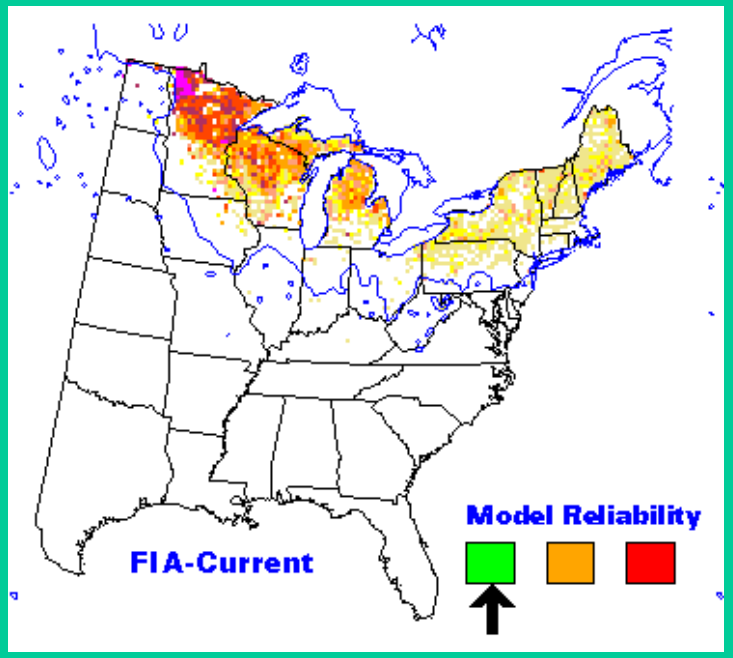
Trembling Aspen Growth

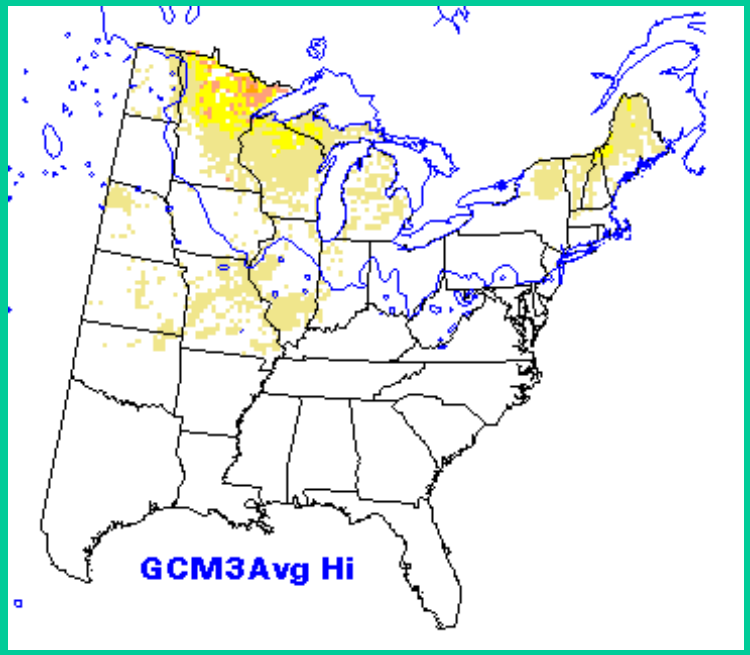


At least in the short-term, forest productivity may increase

Source: Isebrands et al. 2001. Environmental Pollution

Species Habitat Suitability

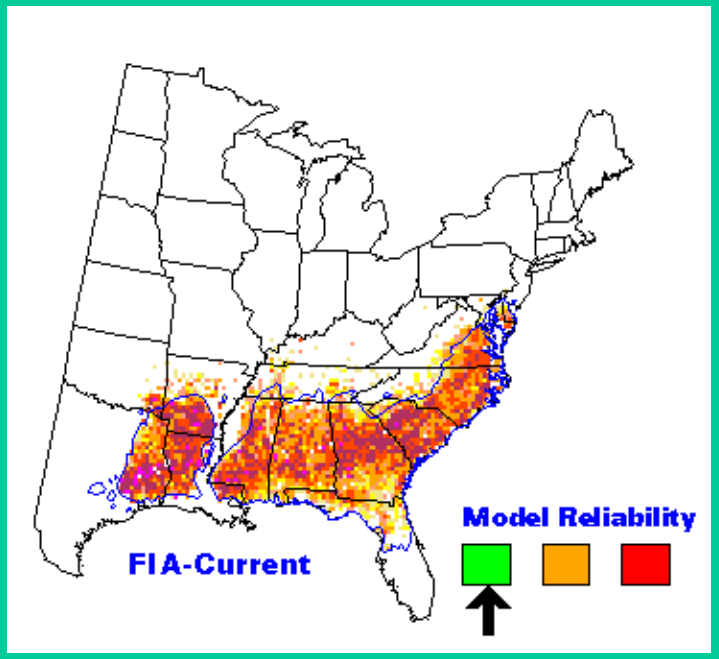


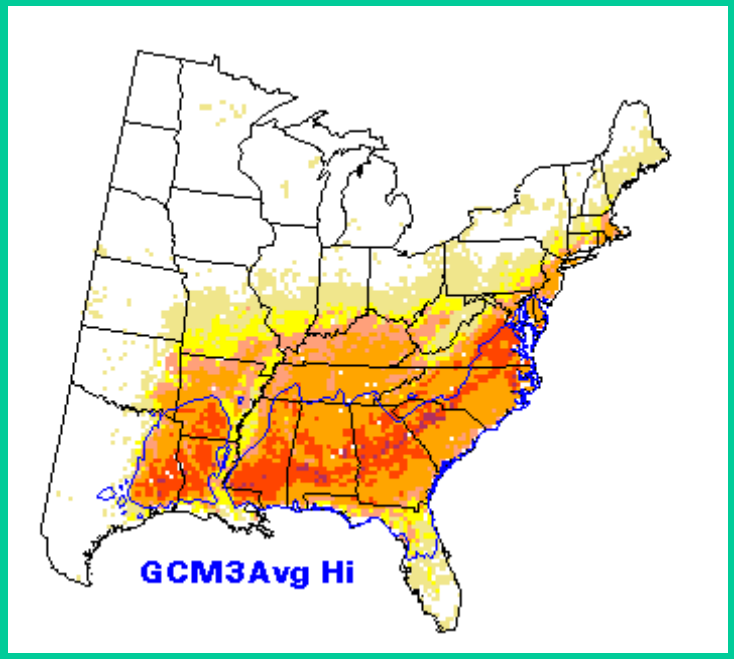


Trembling Aspen

Source: Prasad, et al. 2007. Northern Research Station.

Species Habitat Suitability





Expect the mid-west to become more suitable for some species and less suitable for others

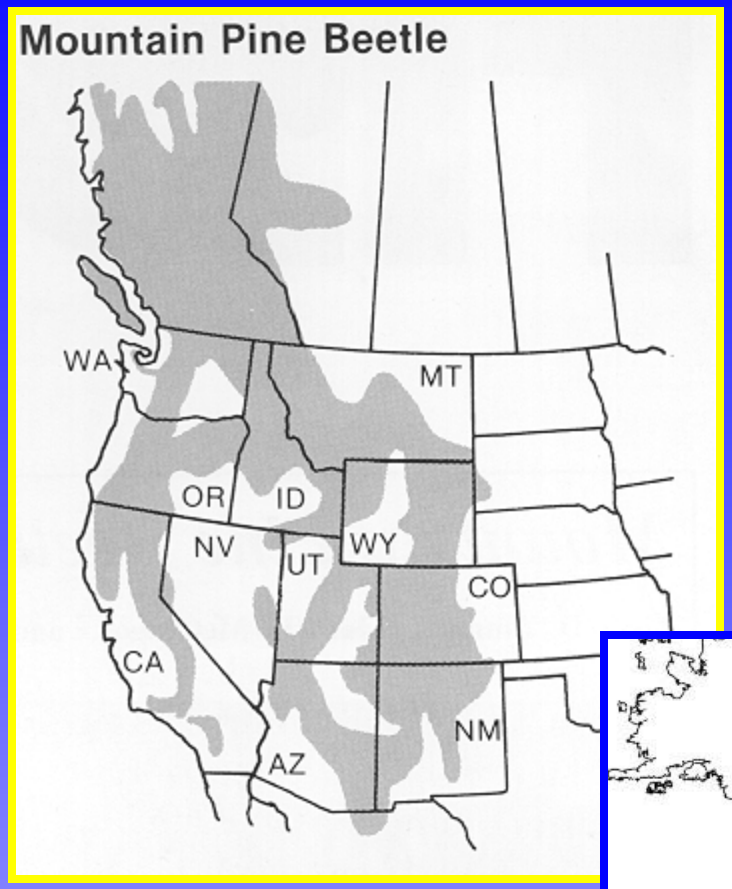
Source: Prasad, et al. 2007. Northern Research Station.

Climate Change: Novel Native Pest Behavior

Mountain Pine Beetle

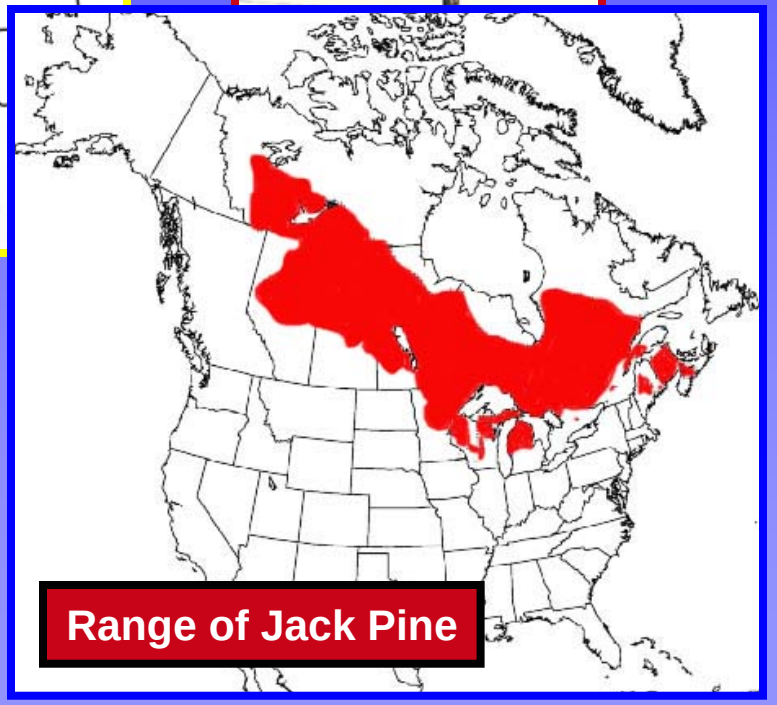
-Expanding population east
-Warmer winters
-Lodgepole pine and other *western* pines
but……..

Lodgepole Pine



Lodgepole Pine

Jack Pine



Expect native pests to behave differently in the future

Expectations for the Future

-Potential increases in forest productivity (short-term?)

-Changes in suitability of habitat for tree species (range shifts)

-Novel native pest behavior

Anticipatory Responses

-Mitigation through carbon management

-Adaptation to a new reality

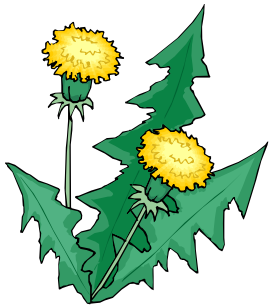
- Experiments in species introductions
- Experiments in adaptive silviculture

Drivers of Forest Change (and where they are being driven)

The Big Four

Climate Change

Nitrogen Deposition



Invasive Species

Landuse Change

Non-Native Invasive Species

Numbers:

Insects: 218

Plants: 627

Diseases: 69

Other: 42

A conservative estimate

Source: USDA Forest Service and USDA APHIS PPQ

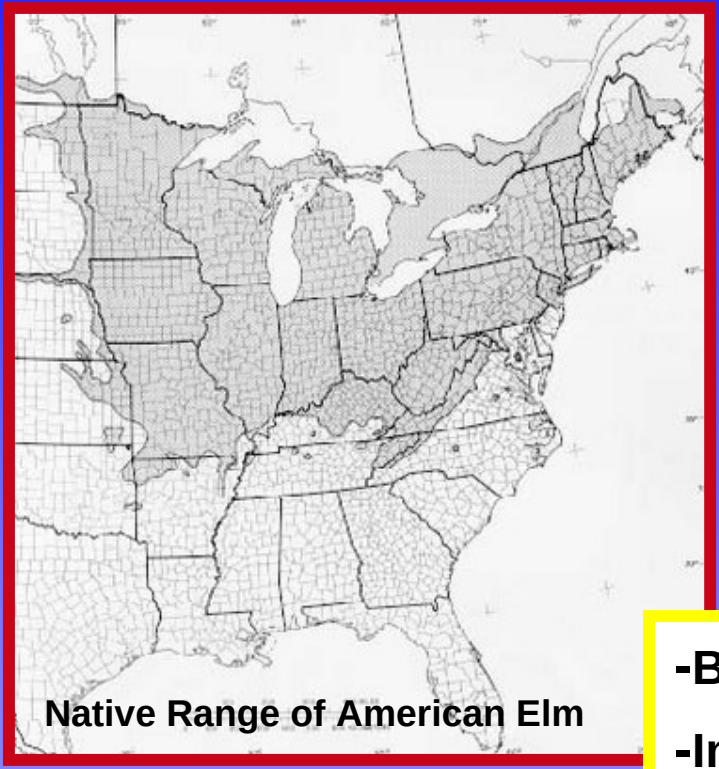
Expectations: **More**

Why: **A global economy**

Concerns **The impacts are cumulative**

Example **Native lowland hardwoods in the mid-west**

American Elm and Dutch Elm Disease



Native Range of American Elm

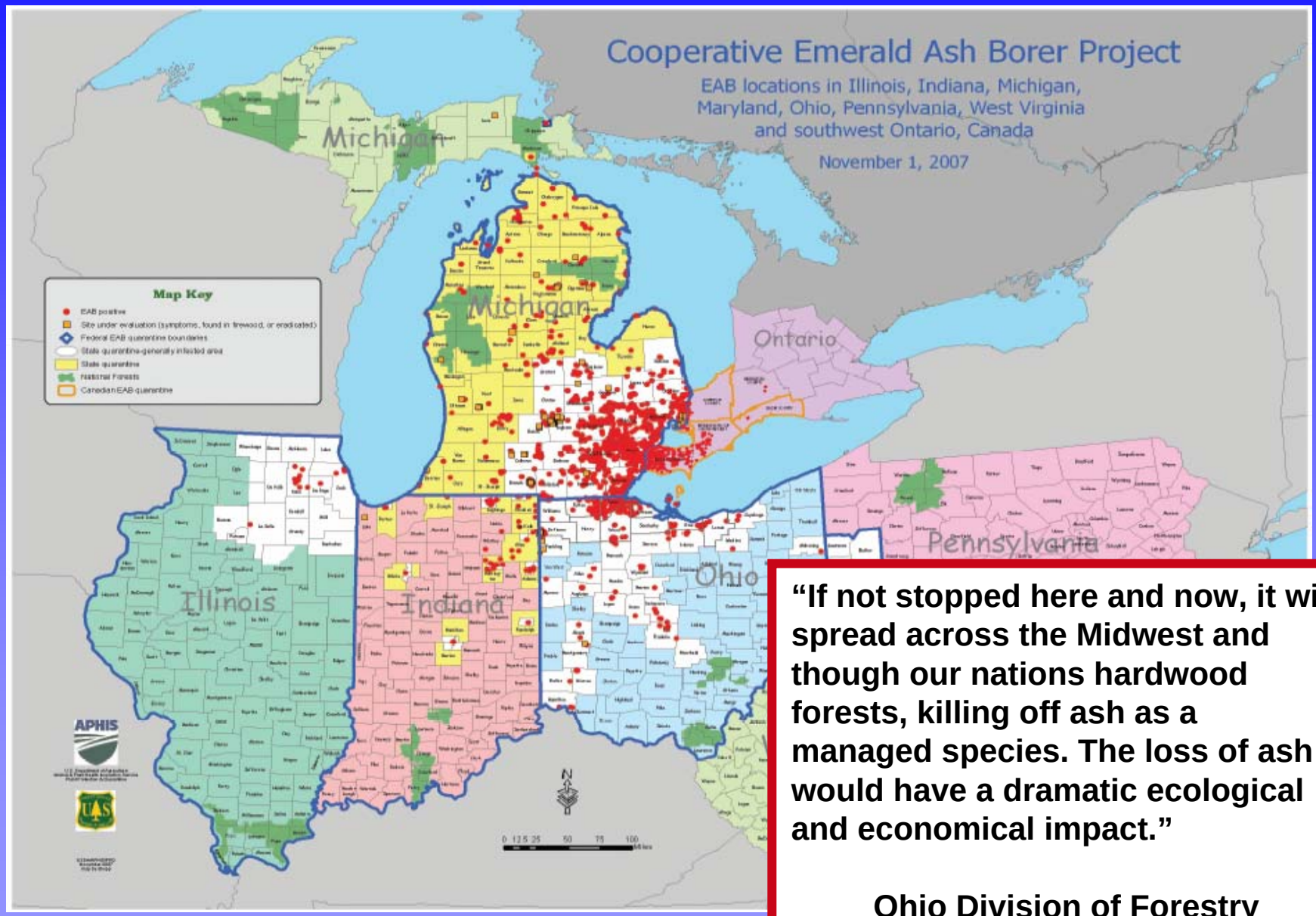
-Bottomland habitats

-Important component of several forest types:

- Black Ash-American Elm-Red Maple
- Silver Maple-American Elm
- Sugarberry-American Elm-Green Ash
- Sycamore-Sweetgum-American Elm

-Populations decimated by Dutch elm disease

The Emerald Ash Borer



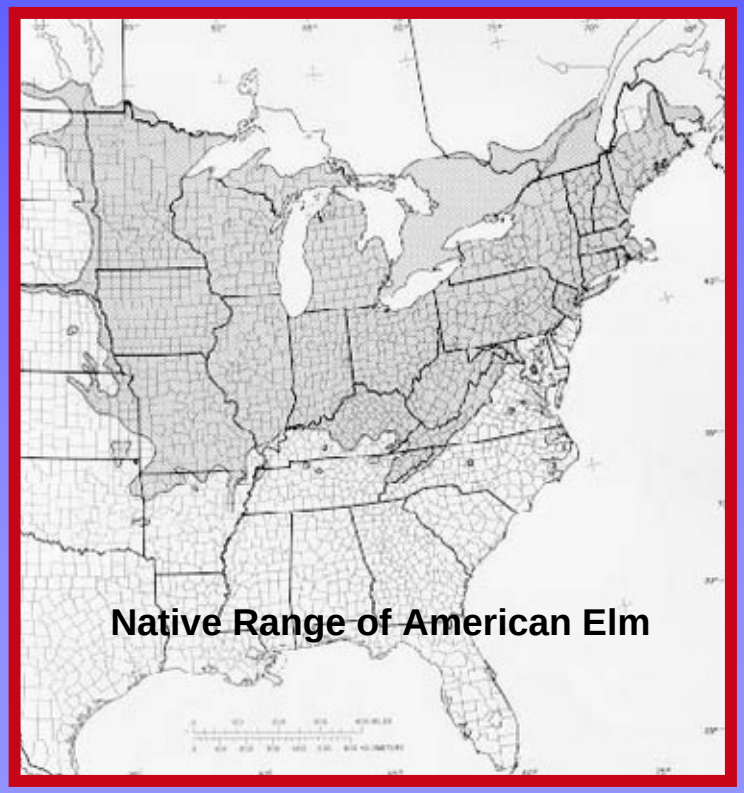
"If not stopped here and now, it will spread across the Midwest and though our nations hardwood forests, killing off ash as a managed species. The loss of ash would have a dramatic ecological and economical impact."

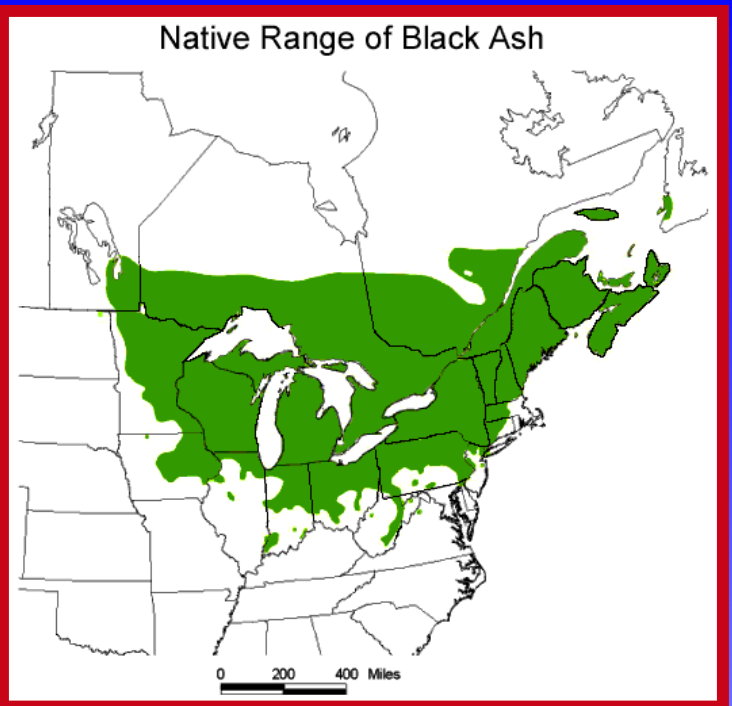
Ohio Division of Forestry

And here is another thing it will do:

Remove a second co-occurring tree species from lowland forest ecosystems,…….

with as yet undetermined ecological effects of *cumulative invasions*





Expectations for the Future

-Increasing numbers of non-native invasive species

-Potential for major forest ecosystem alterations

-Multiple invasions may compound problems

Anticipatory Responses

-Predict and prevent

-Detect and monitor

-Manage and mitigate

-Restore

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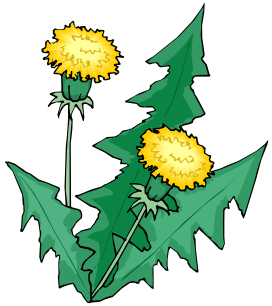


Invasive Species

Landuse Change

Landuse Changes

-Increasing forest parcelization and residential development

-Disintegration of vertically integrated timber industry

-Rise of TIMO’s

-Forest conservation easements and land purchases

-Forest certification and the rise of ecological forestry

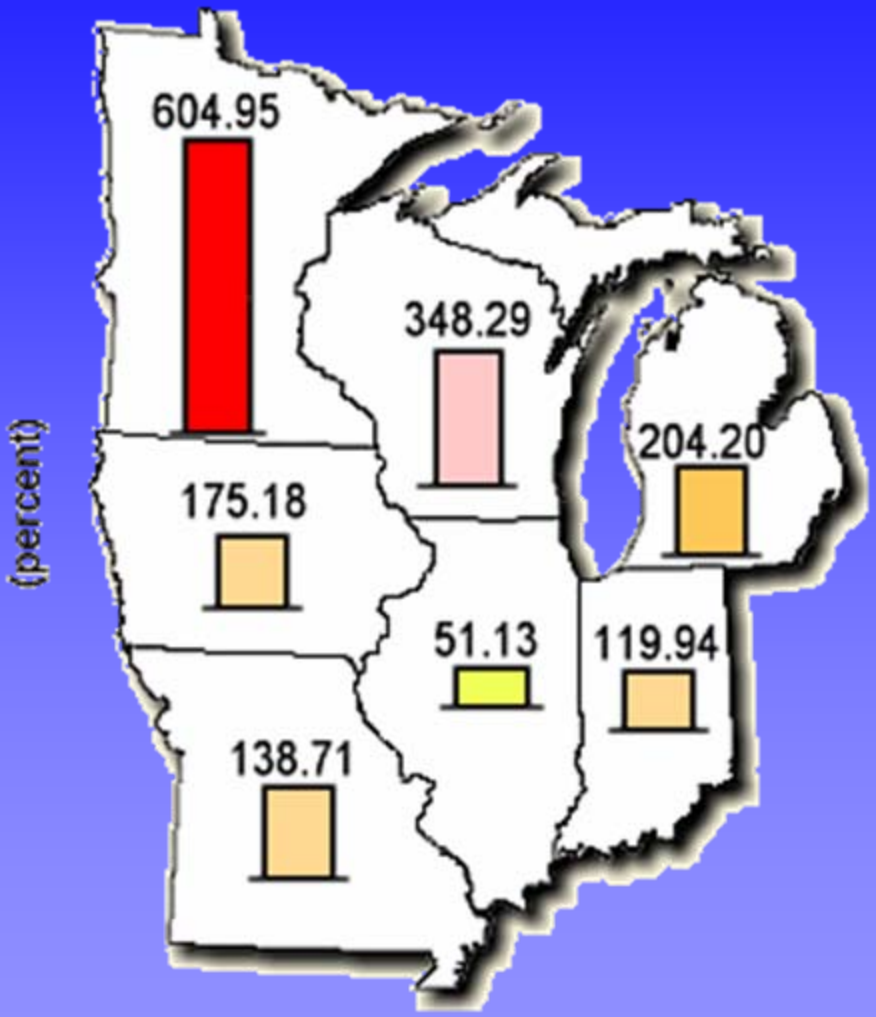
All may have profound effects on forest structure and function at multiple scales

Residential Development in the Forest

-435,000 increase from 1980 to 2000

-225% region wide

-605% in MN = 90,000 units



Percent Change in Density of Seasonal Housing Units

Source: Changing Mid-West Assessment.
Northern Research Station

Residential Development in the Forest

Ecological Expectations

-Decreasing opportunities for forest management

-low desire (landowner objectives)

-low ability (small parcels)

-Changes in forest structure, composition, function

-loss of early successional habitat

-increased fuels and fire risk

-more roads, more edge, loss of interior habitat

Landuse Changes

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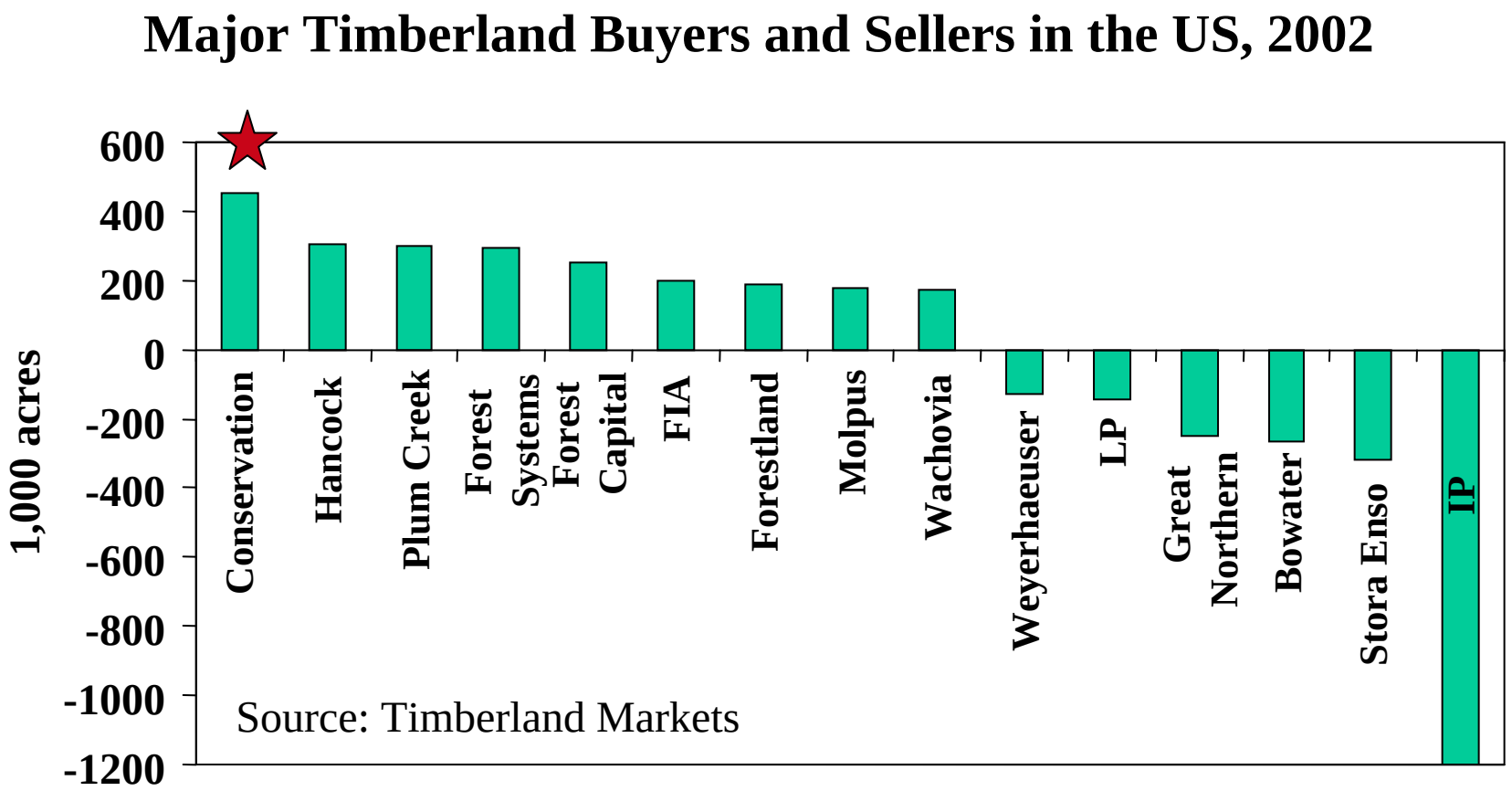
Timberland Sales: Industry, Timo's, and Conservation Purchases



Added to this, increasing use of conservation easements

Timberland Sales: Industry, Timo's, and Conservation Purchases

Ecological Expectations

-Increased sell-off of industry lands

-Uncertainties about long-term fate of forest lands (Timo purchases)

-wide spread forest liquidation, residential development

-disturbed forest, fragmentation, edge effects, etc

-Increase in conservation easements and conservation purchases

-potential for sustaining large tracts of forest intact

-protecting interior habitat

-increased opportunities for sustainable management

Landuse Changes

-Increasing forest parcelization and residential development

-Disintegration of vertically integrated timber industry

-Rise of TIMO’s

-Forest conservation easements and land purchases

-Forest certification and the rise of ecological forestry

Forest Certification

Certification of forest practices:

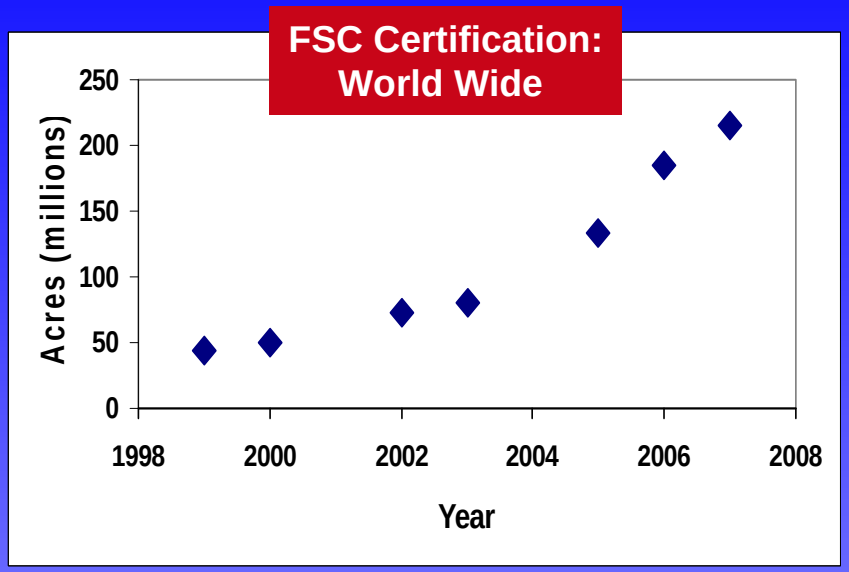
-Quantifiable standards for sustainability

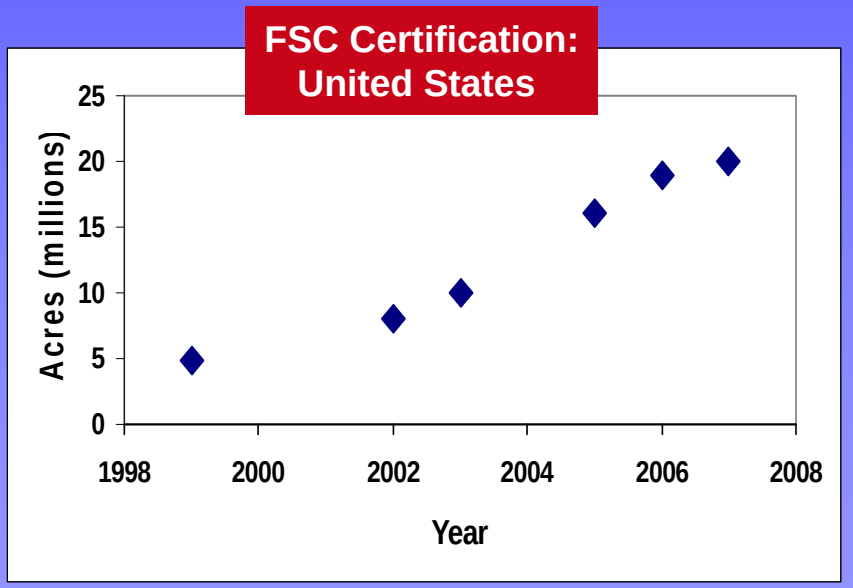
-Increased attention to ecological features (particularly FSC)

-Increasing in US and world wide

-Increasing need for management principles and practices grounded in ecological sustainability

Ecological Forestry





Ecological Forestry

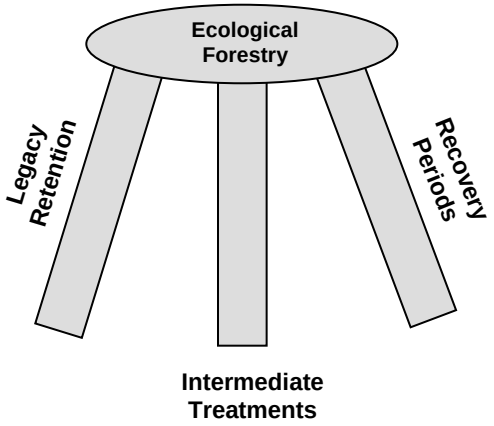
-An opportunity rising out of:

- -forest certification
- -timberland purchases by conservation groups
- -ecological objectives in National Forest and other agency management plans

-Modeled after natural disturbance and forest dynamics and their effects on ecosystem goods and services

-Prediction: will fundamentally alter the way forestry is practiced and appreciated

Natural Models for Ecological Forestry



Jerry F. Franklin
Robert J. Mitchell
Brian J. Palik

NRS GTR (In Press)

Conservation Forestry Network: Workshops in Ecological Forestry

-Minnesota, Wisconsin, Georgia, Oregon

To Conclude:

-Forests are important in the Mid-West

-These forests have changed and will change naturally

-The next decade and beyond will see changes that are unprecedented

-Some of these looming changes are negative, some are positive

-Will we have forests? Yes. Will they look like they do now???